ONTARIO MINISTRY OF ENVIRONMENT
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1966 OPERATING SUMMARY

BELLEVILLE

water pollution control plant

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Belleville : water pollution control plant.

81626

ONTARIO WATER RESOURCES COMMISSION

OFFICE OF THE GENERAL MANAGER

Members of the Local Advisory Committee,
City of Belleville.

Gentlemen:

We are pleased to submit to you the 1966 Operating Summary for the Belleville Water Pollution Control Plant, OWRC Project No. 61-S-84.

It is hoped that our joint participation in efforts to combat water pollution will have even more success in the coming year.

Yours very truly,

D. S. Caverly,
General Manager.

Environment Ontario
Etobicoke, Ontario
Canada

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ONTARIO WATER RESOURCES COMMISSION
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TORONTO 5

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VICE-CHAIRMAN

D. S. CAVERLY
GENERAL MANAGER

W. S. MacDONNELL
COMMISSION SECRETARY

General Manager,
Ontario Water Resources Commission.

Dear Sir:

I am happy to present you with the 1966 Operating Summary for the Belleville Water Pollution Control Plant, OWRC Project No. 61-S-84.

The report offers a concise summary of operating data for the year and comparisons with previous years where these are applicable and significant.

Yours very truly,

B. C. Palmer, P. Eng.,
Director,
Division of Plant Operations.

FOREWORD

● This operating summary contains complete information on the management of the project during 1966. It contains a concise review of the year's plant operation, significant financial details, and a visual presentation in graphs and charts of technical performance.

The information will be of value to interested parties in assessing the adequacy of the project at this time and its ability to meet future requirements.

The report is the result of co-operation by several groups within the Division of Plant Operations. These include the statistics section and the technical publications section. The Division of Finance and the draughting section of the Division of Sanitary Engineering were also closely associated with its publication.

The Regional Operations Engineer, however, has had the primary responsibility for the content, and will be happy to answer any questions regarding it.

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BELLEVILLE

water pollution control plant

operated for

THE CITY OF BELLEVILLE

by

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Operations Engineer: J. N. Dick

801 Bay Street Toronto 5

'66 REVIEW

Belleville Water Pollution Control Plant treated a total of 1994 million gallons of sewage in 1966. This was an average daily flow of 5.45 million gallons per day.

The operating costs for Belleville Water Pollution Control Plant were $51,664.78 in 1966. This was an increase in the operating costs of approximately $5,000. The increase was due to the higher costs for repair and maintenance of the existing equipment; increased water consumption due to chlorination, washing down of the plant, and thinning of the digested sludge; and increased sundry costs.

High flows were again received at the plant in 1966. The total flow to the plant in 1965 was 2070 million gallons; whereas in 1966 the flow was 1994 million gallons. This has resulted in the average daily flow being above the design flow of three million gallons per day, almost every day of the year. The highest flows were received at the plant in the months of November and December, as shown in the graphs in this report.

The No. 4 pump in the Front Street pumping station was completely rebuilt. This involved installation of a new impeller, a new shaft sleeve, and new bearings. The No. 1 pump at Front Street was also rebuilt. The flows to this pumping station are generally quite high and it necessitates a considerable amount of work from these sewage pumps. The No. 1 pump in the pumping station located at the plant site was also rebuilt with a new shaft, new wearing rings, new bearings and a new shaft sleeve.

In the spring of the year, it was discovered that the gas line leading from the digester to the administration building would not hold a satisfactory pressure. Further investigation revealed that the gas pipe had been sheared off at the administration building. The work was rather tedious

in that the pipe had been covered with a considerable amount of concrete which had to be broken away in order to make the necessary repairs.

The operation of the boiler at the plant was also improved. Until last year, the boiler would change over to oil only when the supply of sewage gas became depleted. The modification that was made to the boiler last year also facilitates the boiler reverting automatically back to digester gas should the supply of digester gas have built up in the meantime.

Four sump pumps were rebuilt in 1966. The barminutor also broke down and a new shaft and new sprocket had to be purchased and installed on the barminutor to repair the damaged parts.

The digested sludge and, to some extent, the raw sludge is difficult to handle at times because of the concentration. The digested sludge is particularly difficult to handle, and at times must be diluted with water to make it thin enough to pump to the sludge hauling trucks.

Repairs were also made to the telemetering system from time to time and this was corrected as part of the normal repair and maintenance operation.

It was realized in 1966 that the operating work load at the plant had exceeded that of the staff at the plant. Preparations were made at that time for the hiring of an operator mechanic in the beginning of 1967 so that this man could help with the additional work of repairing the various pumps and other mechanical machinery that at times breaks down.

The average BOD of the plant influent was 76 ppm while the average suspended solids of the plant influent was 158 ppm in 1966. The effluent of the plant contained a BOD of 43 ppm and suspended solids of 84 ppm. This resulted in a BOD reduction of 43 1/2 percent and a suspended solids reduction of 47 percent. These are percentage reductions that should be expected from a primary treatment plant.

The plant was inspected by head office personnel and found to be in satisfactory condition. The plant staff are to be commended for their interest in the fight against water pollution.

PROJECT COSTS

NET CAPITAL COST (Estimated)	$1,999,587.97
DEDUCT - Portion Financed by CMHC (Estimated)	1,283,187.17
Long Term Debt to OWRC	$ 716,400.80
Debt Retirement Balance at Credit (Sinking Fund) December 31, 1966	$ 54,868.24
Net Operating	$ 51,664.78
Debt Retirement	14,458.00
Reserve	12,553.57
Interest Charged	40,295.84
TOTAL	$ 118,972.19

RESERVE ACCOUNT

Balance at January 1, 1966	$ 35,631.93
Deposited by Municipality	12,553.57
Interest Earned	2,246.14
	$ 50,431.64
Less Expenditures	-
Balance at December 31, 1966	$ 50,431.64

MONTHLY OPERATING COSTS

MONTH	TOTAL EXPENDITURE	PAYROLL	CASUAL PAYROLL	FUEL	POWER	CHEMICAL	GENERAL SUPPLIES	EQUIPMENT	REPAIRS & MAINTENANCE	*SUNDRY	WATER
JAN	3585.96	1169.99		129.21			64.96	69.02	510.85	1641.93	
FEB	2448.78	1149.94		391.32	677.08		19.25		91.94	58.64	60.61
MARCH	3175.74	1186.68		395.14	694.30		111.92		399.56	334.94	53.20
APRIL	3158.80	1804.11		260.19	772.12		36.38	42.38	152.61	47.69	43.32
MAY	2911.24	1375.45		117.60	640.61	117.26	286.85		1.89	312.14	59.44
JUNE	14329.37	1345.69	45.36	352.80	581.42	1029.00	107.98	80.99	370.10	10258.53	157.50
JULY	3380.58	1321.33	259.20	117.60	586.10		42.18	98.39	217.45	240.84	497.49
AUG	3276.08	1317.85	259.78		618.85		134.13		160.59	209.30	575.58
SEPT	5109.15	1969.33	225.11	117.60	610.52	1029.00	178.70		67.73	393.04	518.12
OCT	3217.72	1282.16			570.99		11.03			843.27	510.27
NOV	2988.61	1271.15		235.20	586.61		128.54		161.47	55.94	549.70
DEC	4082.75	1268.00		33.69	1128.93		245.43	14.79	149.70	565.79	376.42
TOTAL	51664.78	16461.68	789.45	2450.35	7467.53	2175.26	1367.35	305.57	2283.89	14962.05	3401.65

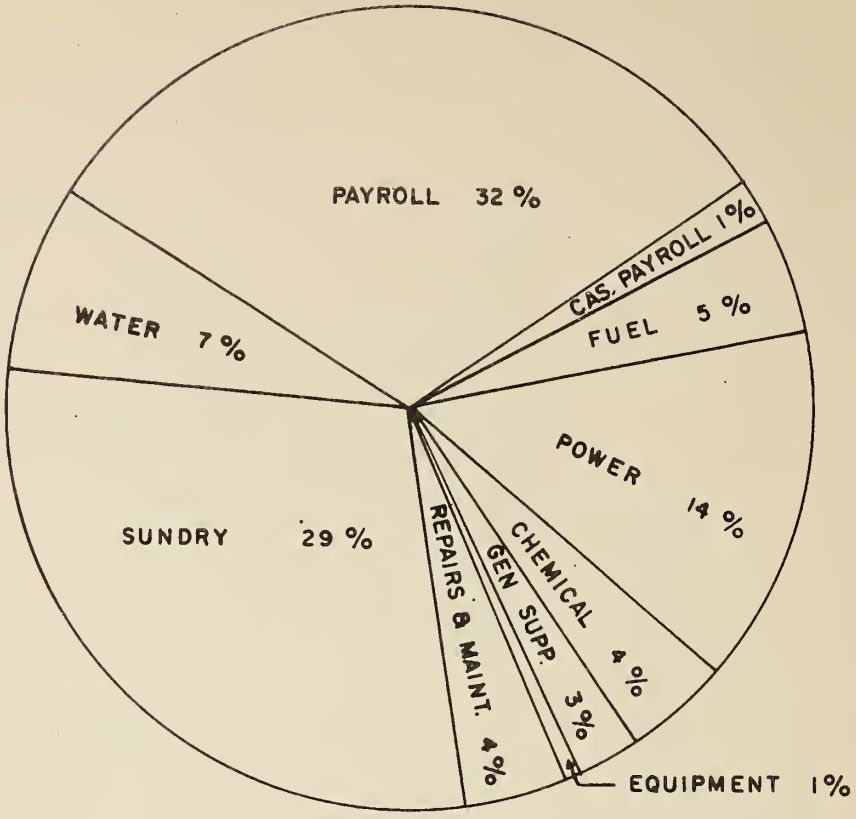
* SUNDRY INCLUDES SLUDGE HAULING COSTS WHICH WERE $1580.40

YEARLY OPERATING COSTS

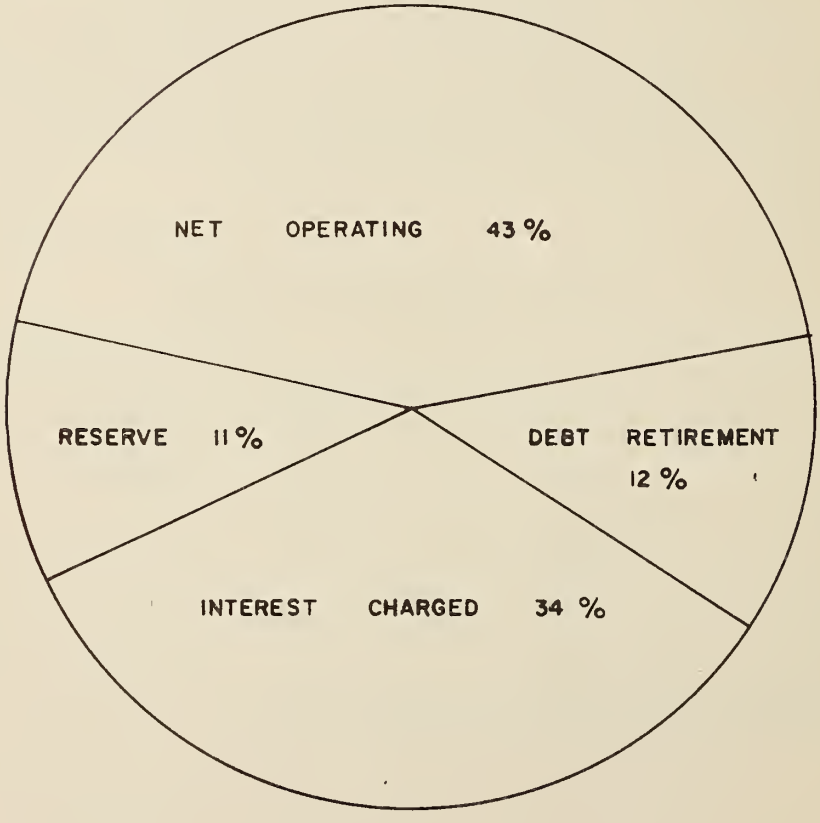
YEAR	M.G. TREATED	TOTAL COST	COST PER FAMILY PER YEAR	COST PER MILLION GALLONS	COST PER L.B. OF BOD REMOVED
1963	1400	$42885	*$5.46	$30.64	$0.06
1964	1880	41246	5.25	21.94	0.025
1965	2070	45122	5.50	21.80	0.05
1966	1994	51665	6.12	25.91	0.08

* BASED ON ANNUAL POPULATION ESTIMATE AND 3.9 PERSONS PER FAMILY

1966 OPERATING COSTS



TOTAL ANNUAL COST

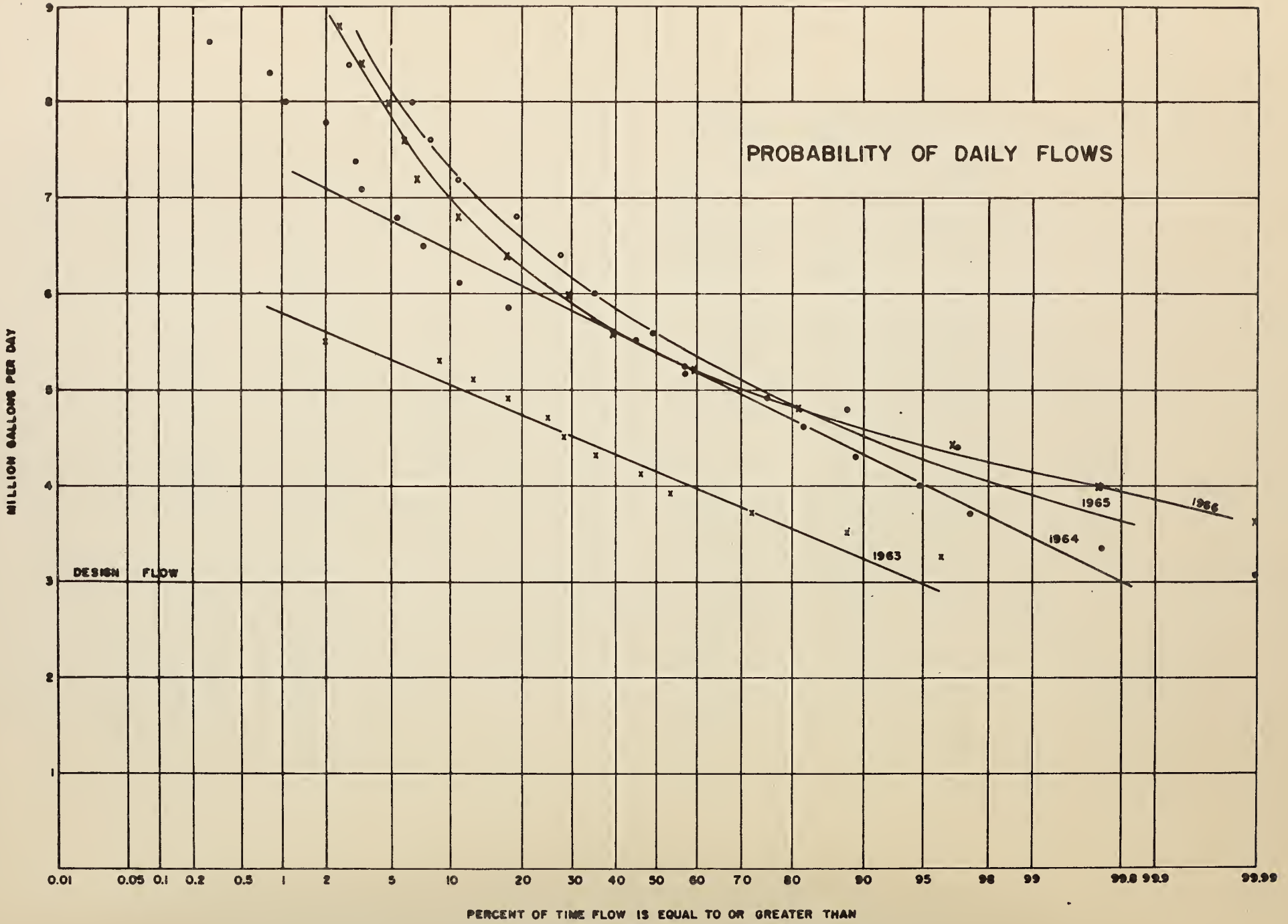


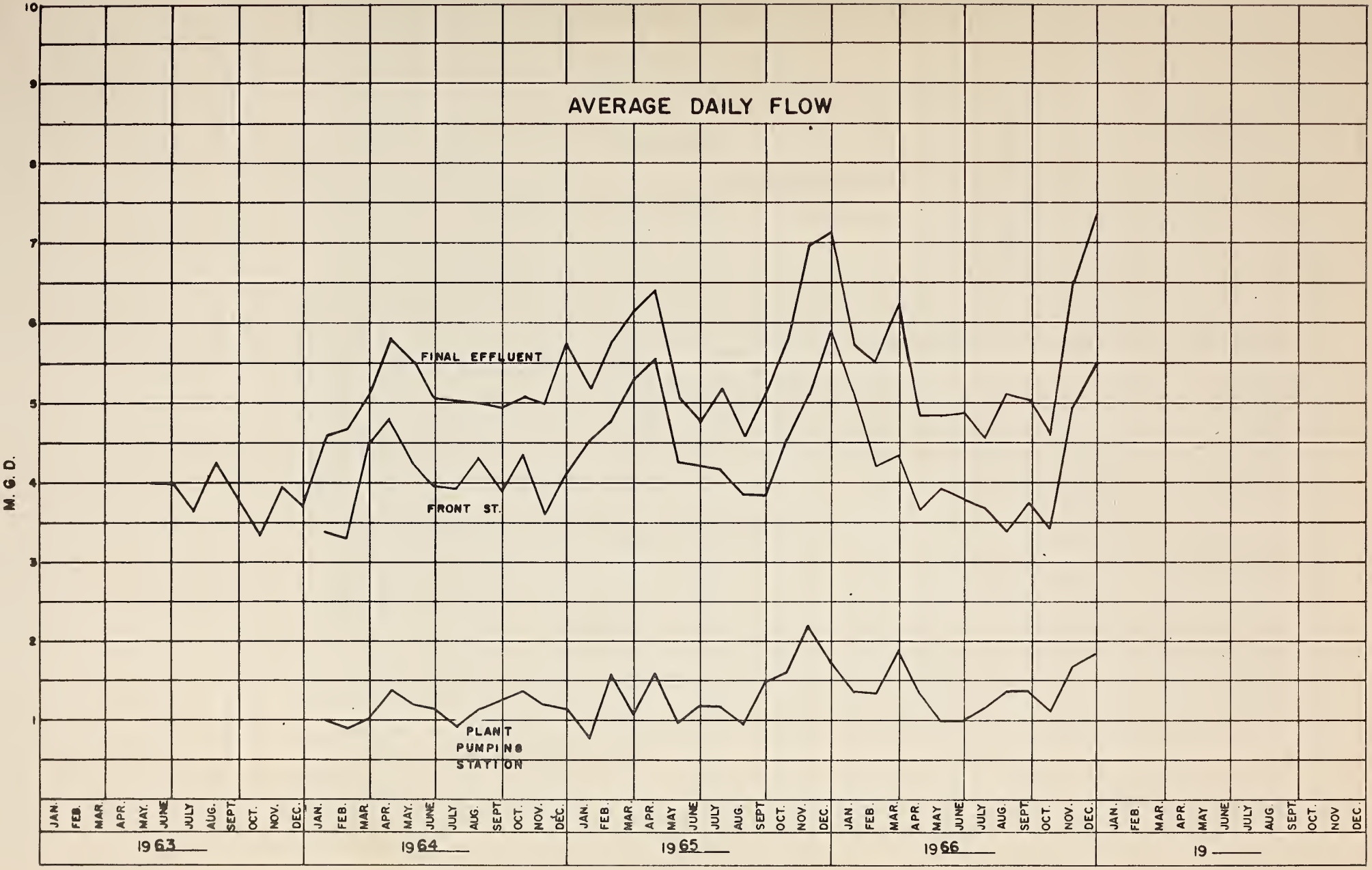
Process Data

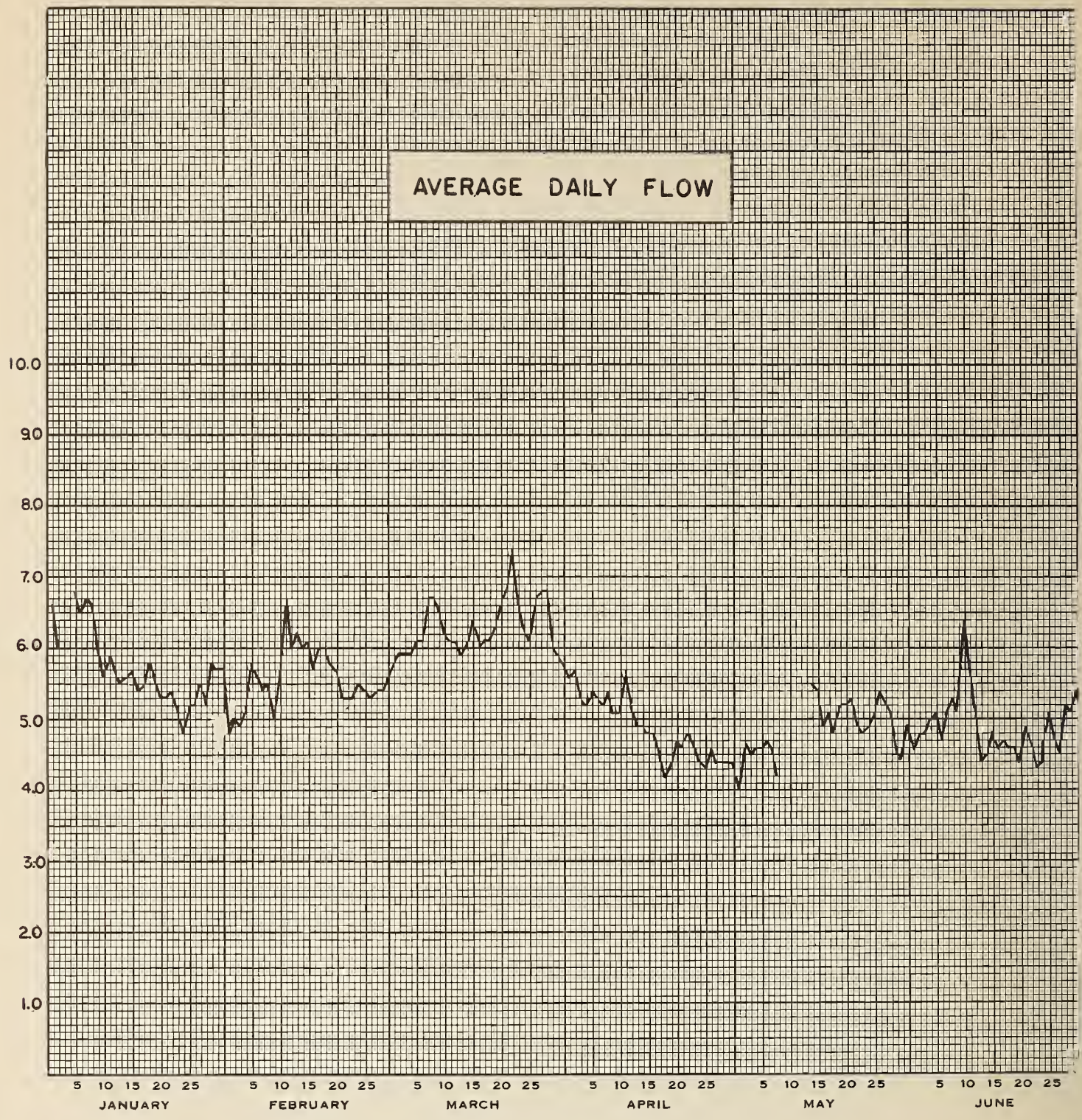
FLOWS

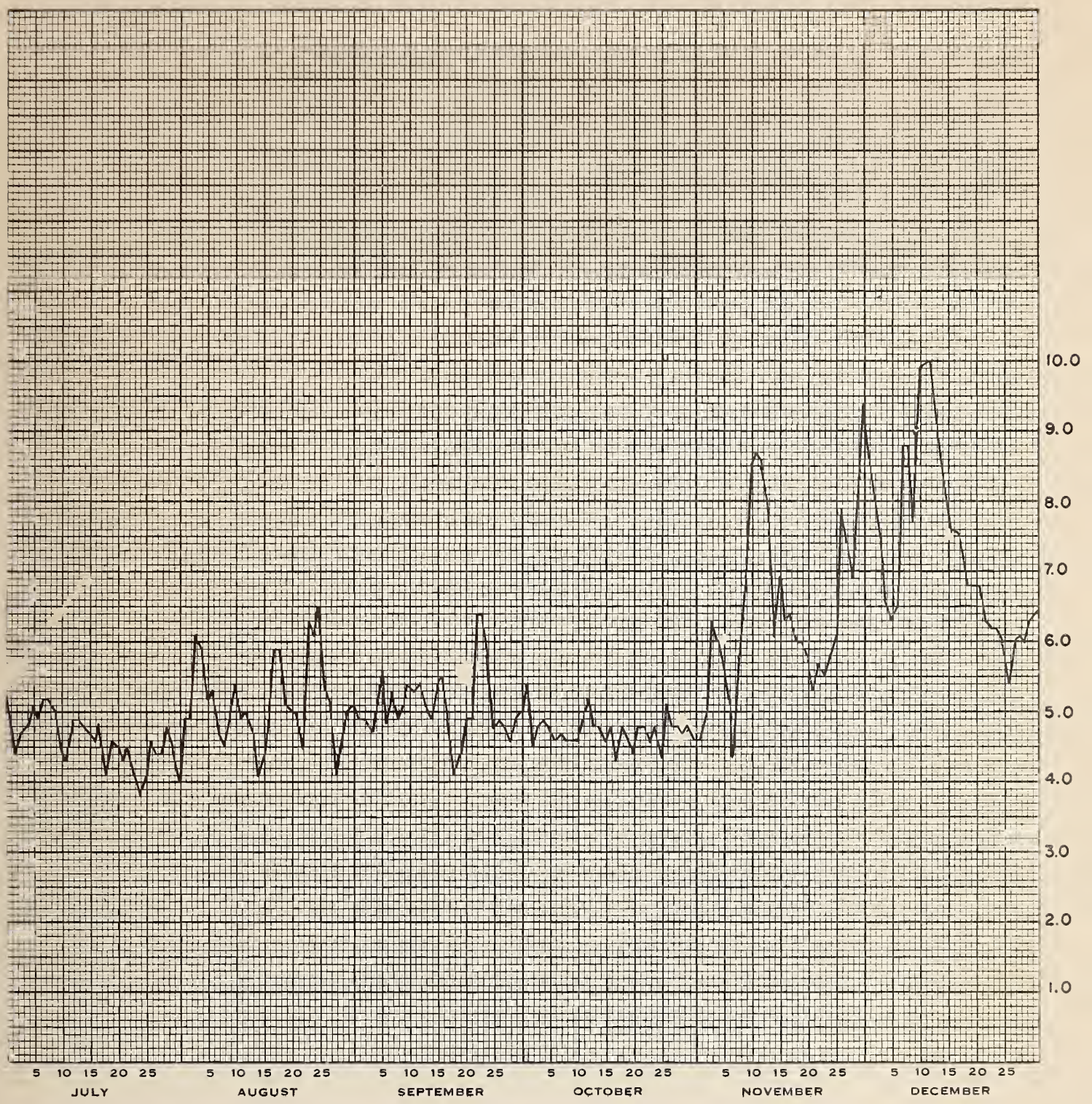
Sewage flows to Belleville Water Pollution Control Plant totalled 1,994 million gallons. The average daily flow to the plant in 1966 was 5.5 million gallons per day. The average daily flow in 1963, 1964 and 1965 was 3.8, 4.9 and 5.7 million gallons per day respectively. From the plot of probability of flows it will be noted that fifty percent of the time the flows exceeded approximately 5.5 million gallons per day. This is approximately 2.5 million gallons per day over the design flow of 3 million gallons per day. From the daily flow diagram it should be noted that the high flows were received at the plant in the months of November and December of 1966.

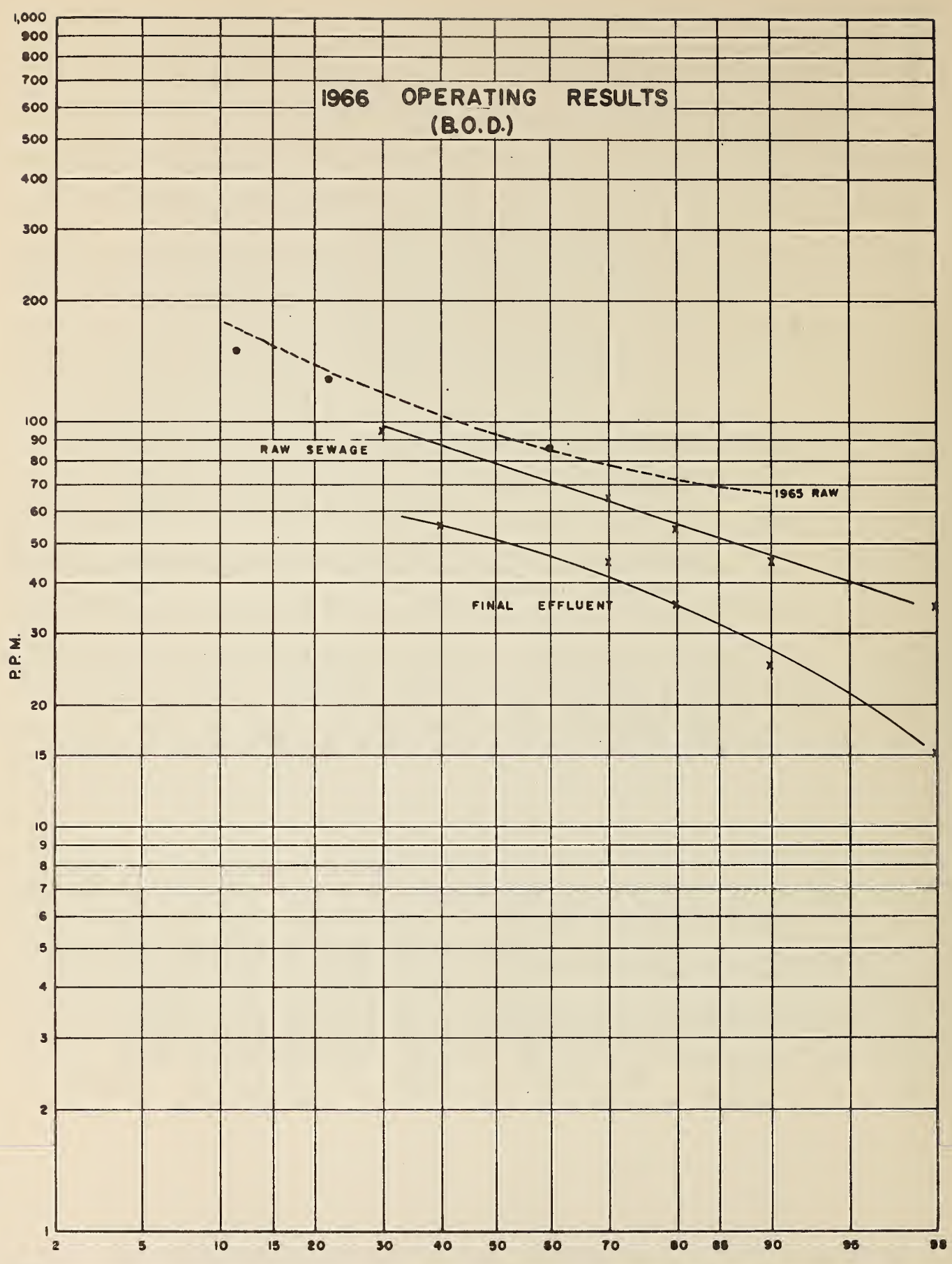
It is felt that the large flows received at the plant are largely due to storm water gaining access to the sanitary sewers, and the program that the City of Belleville is initiating from year to year in the separation of storm water from sanitary sewers should greatly aid in the decrease of this storm water.

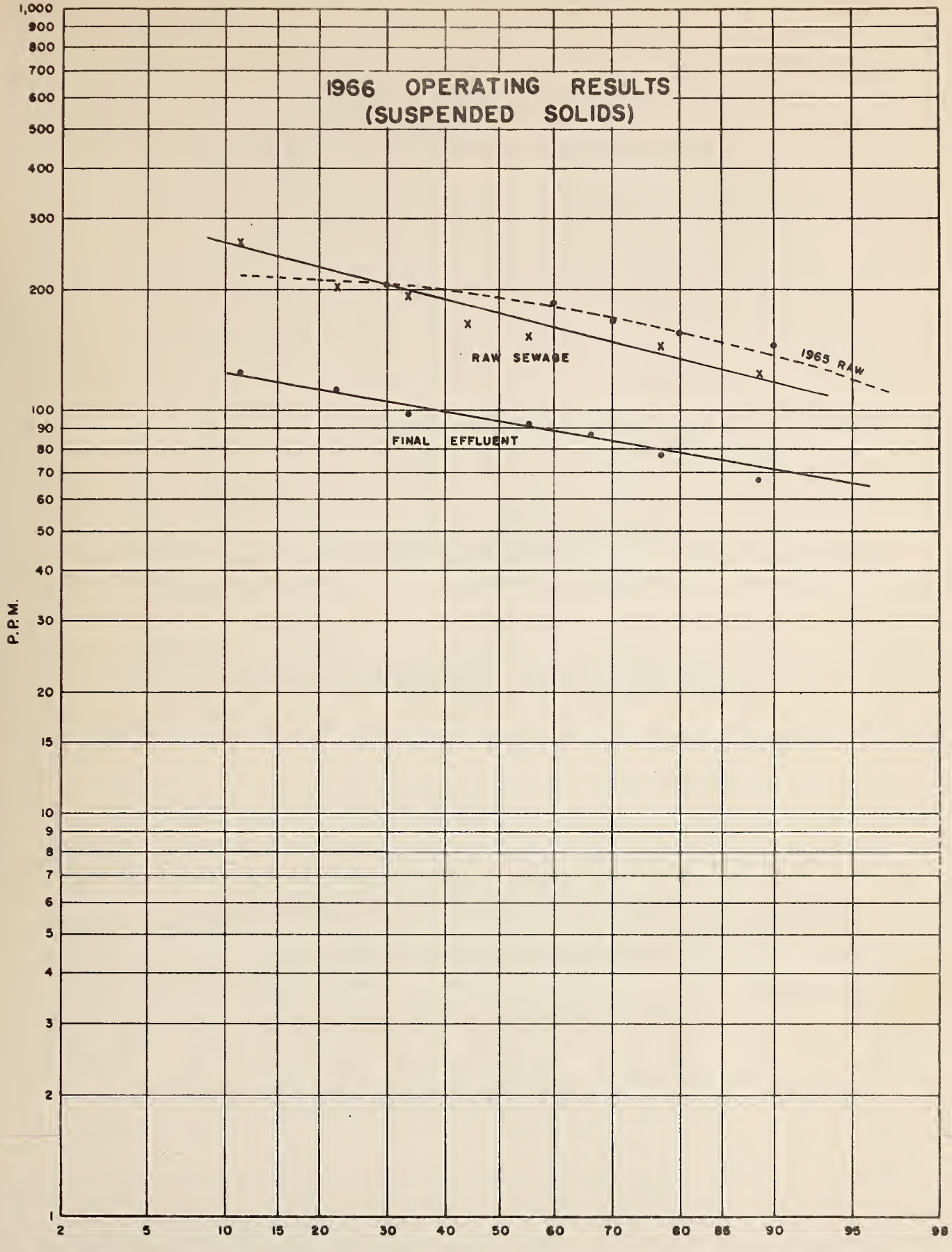

PROBABILITY OF DAILY FLOWS
MILLION GALLONS PER DAY
DESIGN FLOW
1963
1964
1965
1966
9
8
7
6
5
4
3
2
1
0.01
0.05
0.1
0.2
0.5
1
2
5
10
20
30
40
50
60
70
80
90
95
98
99
99.8
99.9
99.99
PERCENT OF TIME FLOW IS EQUAL TO OR GREATER THAN

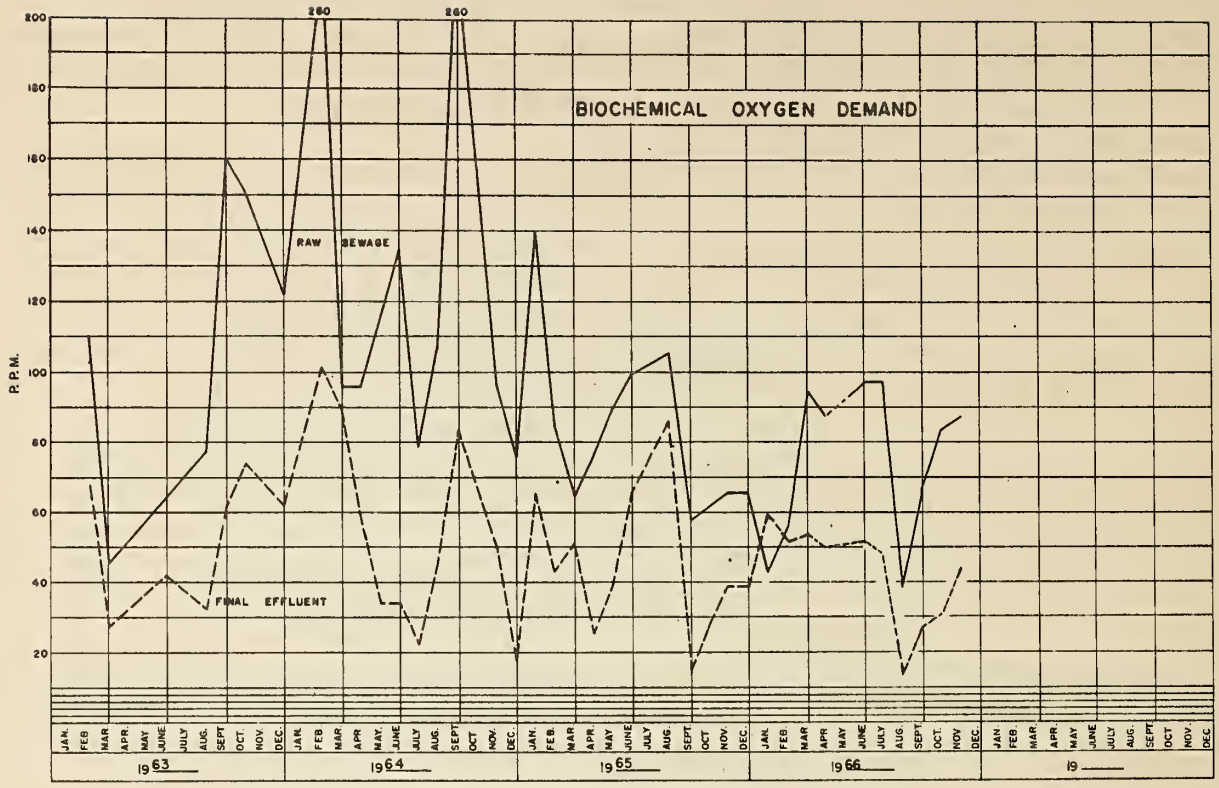

AVERAGE DAILY FLOW
M. G. D.
10
9
8
7
6
5
4
3
2
1
FINAL EFFLUENT
FRONT ST.
PLANT
PUMPING
STATION
JAN. FEB. MAR. APR. MAY. JUNE JULY AUG. SEPT. OCT. NOV. DEC.
1963
1964
1965
1966
19


AVERAGE DAILY FLOW
DAILY FLOW IN MILLIONS OF GALLONS
10.0
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
5 10 15 20 25
JANUARY
5 10 15 20 25
FEBRUARY
5 10 15 20 25
MARCH
5 10 15 20 25
APRIL
5 10 15 20 25
MAY
5 10 15 20 25
JUNE

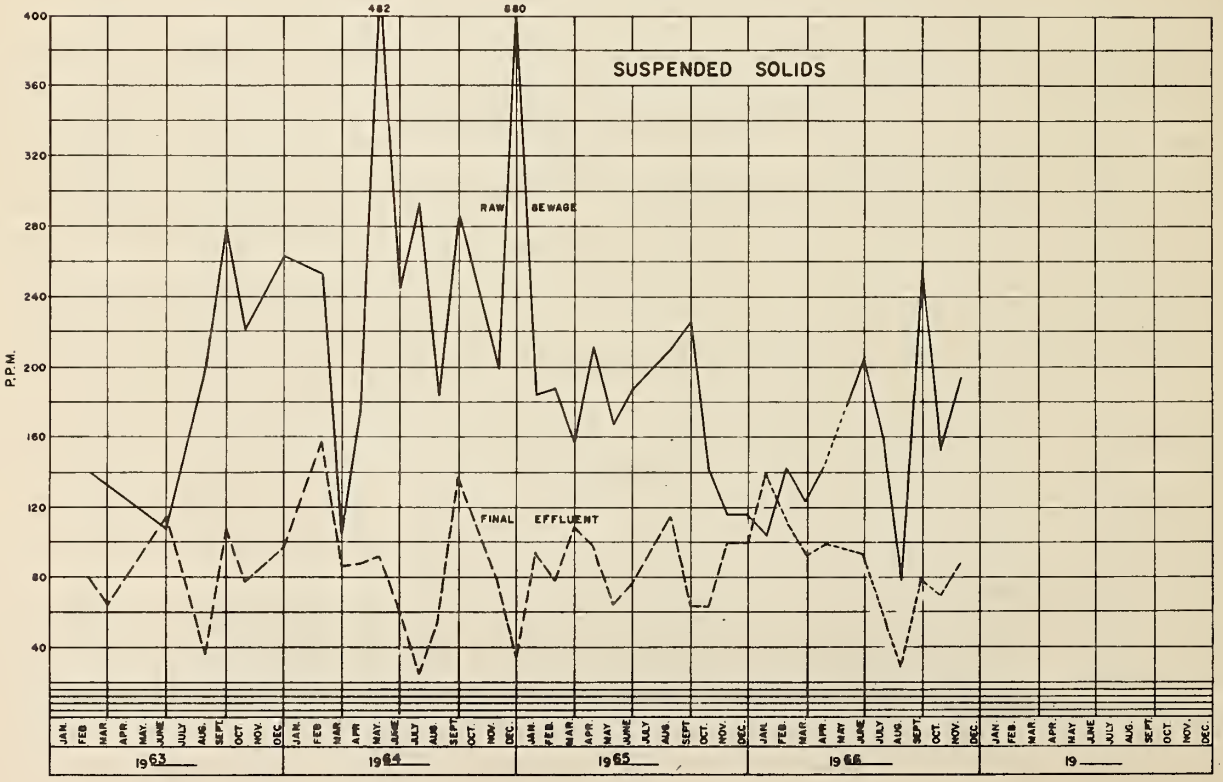

10.0
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
5 10 15 20 25
JULY
5 10 15 20 25
AUGUST
5 10 15 20 25
SEPTEMBER
5 10 15 20 25
OCTOBER
5 10 15 20 25
NOVEMBER
5 10 15 20 25
DECEMBER


1966 OPERATING RESULTS
(B.O.D.)
RAW SEWAGE
1965 RAW
FINAL EFFLUENT
P.P.M.
1,000
900
800
700
600
500
400
300
200
100
90
80
70
60
50
40
30
20
15
10
9
8
7
6
5
4
3
2
1
2
5
10
15
20
30
40
50
60
70
80
85
90
95
98
% EQUAL TO OR GREATER THAN


1966 OPERATING RESULTS
(SUSPENDED SOLIDS)
RAW SEWAGE
1965 RAW
FINAL EFFLUENT
P.P.M.
1,000
900
800
700
600
500
400
300
200
100
90
80
70
60
50
40
30
20
15
10
9
8
7
6
5
4
3
2
1
2
5
10
15
20
30
40
50
60
70
80
85
90
95
98
% EQUAL TO OR GREATER THAN



MONTHLY VARIATIONS



MONTH	B. O. D.				S. S.				GRIT REMOVAL CU. FT.
	INFLUENT P.P.M.	EFFLUENT P.P.M.	% REDUCTION	TONS REMOVED	INFLUENT P.P.M.	EFFLUENT P.P.M.	% REDUCTION	TONS REMOVED	
JAN.	43	59	0.0	0.0	118	130	0.0	0.0	162
FEB.	56	52	7.0	3.1	142	112	21.0	23.2	162
MAR.	96	54	44.0	40.6	123	92	25.0	30.0	162
APR.	88	50	43.0	27.8	144	98	32.0	33.6	-
MAY	*76	43	43.5	24.9	*158	84	47.0	55.8	-
JUNE	98	52	47.0	33.8	206	93	55.0	82.9	162
JULY	98	44	55.0	38.4	162	61	62.5	71.9	162
AUG.	38	13	65.5	19.9	78	25	68.0	42.2	108
SEPT.	68	27	60.0	31.3	260	78	70.0	139.1	-
OCT.	84	31	63.0	37.8	152	68	55.5	103.5	297
NOV.	88	44	50.0	42.9	194	87	55.0	104.4	-
DEC.	*76	43	43.5	37.8	*158	84	47.0	84.8	162
TOTAL	-	-	-	329.0	-	-	-	737.7	1377
AVG.	76	43	43.5	27.4	158	84	47.0	61.5	115

* Average values substituted. No samples.

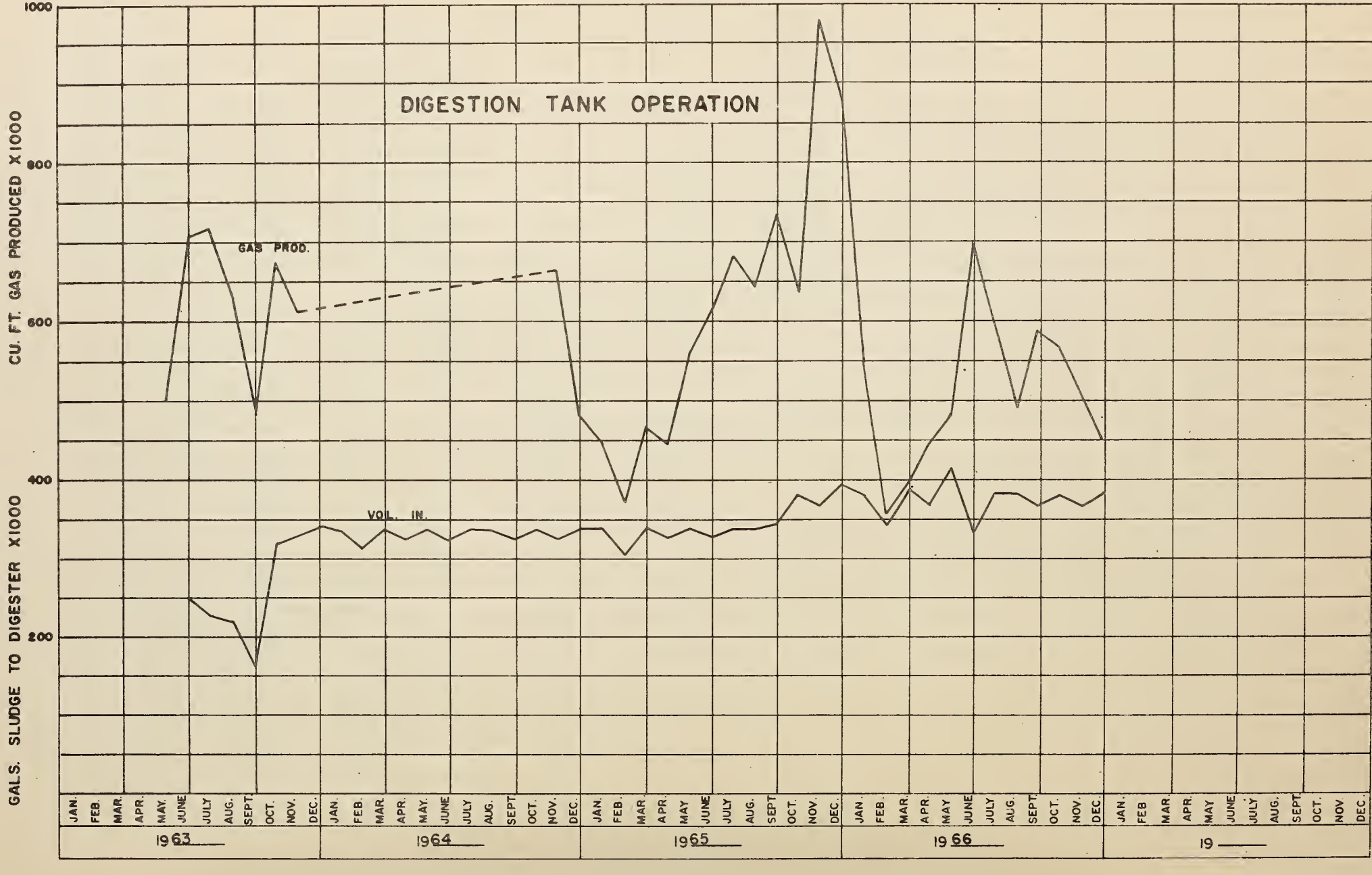
COMMENTS

In 1966, ten eight-hour composite samples were collected from the plant influent and effluent and submitted to the OWRC Laboratory for analysis for BOD and suspended solids. The results of these analyses indicate that the average BOD of the influent was 76 ppm and the average influent of suspended solids was 158 ppm. The results of the effluent indicated an average BOD of 43 ppm and a suspended solids concentration of 84 ppm. This resulted in a BOD reduction of 43.5% and a suspended solids reduction of 47%.

These values are very similar to those in 1965. A total of 329 tons of BOD waste and 738 tons of suspended solids were removed from the raw sewage of the City of Belleville in 1966.

The total quantity of grit removed at the plant in 1966 was 1,377 cubic feet. This is a considerable decrease from that received in 1965. Although this quantity still appears rather excessive the decrease could be due to the fact that some storm water has been already eliminated from the sanitary sewers.

For a primary treatment plant the removals stated above are satisfactory from the Belleville WPCP.


DIGESTION TANK OPERATION
CU. FT. GAS PRODUCED X1000
GALS. SLUDGE TO DIGESTER X1000
1000
800
600
400
200
GAS PROD.
VOL. IN.
JAN. FEB. MAR. APR. MAY. JUNE JULY AUG. SEPT. OCT. NOV. DEC.
1963
1964
1965
1966
19

DIGESTER OPERATION

MONTH	SLUDGE TO DIGESTERS			SLUDGE FROM DIGESTERS			GAS PRODUCED 1000'S Cu. Ft.
	1000'S CU FT.	% SOLIDS	% VOL. MAT.	1000'S CU. FT.	% SOLIDS	% VOL. MAT	
JAN	61.12	1.20	-	6.53	15.00	-	549.30
FEB.	55.20	1.22	-	6.16	8.09	-	357.11
MAR.	61.12	2.61	-	6.16	9.66	-	399.20
APR.	59.15	0.56	-	6.48	20.09	-	443.28
MAY	67.04	-	-	12.12	-	-	482.50
JUNE	53.23	6.45	-	11.86	15.55	-	694.10
JULY	61.12	2.74	-	9.46	10.22	-	590.43
AUG.	61.12	-	-	3.89	-	-	492.42
SEPT.	59.15	2.26	-	6.09	4.90	-	593.04
OCT.	61.12	2.60	-	8.17	6.90	-	570.37
NOV.	59.15	1.64	-	9.94	1.43	-	509.73
DEC.	61.12	-	-	13.62	-	-	445.19
TOTAL	719.64	-	-	100.48	-	-	6126.67
AVG.	59.97	2.36	-	8.37	10.20	-	510.56

COMMENTS

In 1966, a total of 719,000 cubic feet of sludge was pumped to the digesters with a total solids concentration of 2.36%. The quantity of sludge removed from the digesters was 100,000 cubic feet with a total solids concentration averaging about 10%. This is a reduction by volume of approximately 85 percent. The gas that was produced from the sludge that was decomposed in the digesters amounted to 6,126,000 cubic feet of gas. This gas was utilized in the heating of the plant buildings which greatly reduced the consumption of oil which would otherwise have to be purchased.

The values stated above are quite similar to those of 1965. The cost of hauling sludge from the plant is presently contracted at 60¢ per cubic yard.

CHLORINATION

MONTH	PLANT FLOW (MG)	POUNDS CHLORINE	DOSAGE RATE (PPM)
JANUARY	180.30	-	-
FEBRUARY	154.70	-	-
MARCH	193.50	-	-
APRIL	146.30	-	-
MAY	150.94	* 2664	3.65
JUNE	146.80	4883	3.33
JULY	142.40	4365	3.51
AUGUST	159.30	5225	3.28
SEPTEMBER	152.90	5515	3.61
OCTOBER	142.49	5566	3.91
NOVEMBER	195.10	** 3105	2.81
DECEMBER	229.10	-	-
TOTAL	1993.83	31323	-
AVERAGE	166.15	4475	3.38

* 15 days chlorination
** 17 days chlorination

COMMENTS

Chlorination is practised at Belleville Water Pollution Control Plant to disinfect the final effluent from the plant before it is discharged into the Bay of Quinte. Chlorination was started at the Belleville plant on May 15, 1966, and discontinued on November 17, 1966. The total of 31,323 pounds of chlorine was used to obtain a chlorine residual of 0.5 ppm after fifteen minutes of contact.

CONCLUSIONS

The plant was hydraulically overloaded most of the time in 1966. An Engineering Report on enlargement of the plant and provision for secondary treatment was prepared. The results of this report should probably be known and acted upon in 1967.

RECOMMENDATIONS

Steps should be continued to reduce the high flow at the Belleville Water Pollution Control Plant contributed by the storm water gaining access to the sanitary sewer system.

ONTARIO WATER RESOURCES COMMISSION
DIVISION OF PLANT OPERATIONS.

BELLEVILLE - WATER POLLUTION
CONTROL PLANT. OPERATING SUMMARY
1966
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